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## Backup D-channel

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A second D-channel can be added to a Primary Rate Interface (PRI) link to provide a backup as shown in Figure 16. When the active D-channel goes down, two things automatically occur: the standby D-channel is brought into the In-service (active) state and the auto-recovery on the failed D-channel starts.

The backup D-channel is installed and configured the same way as the primary D-channel. See *ISDN Primary Rate Interface installation* (553-2901-200) for installation procedures.

In X11 releases 14 through 16, the backup D-channel supports Meridian 1 to Meridian 1 connectivity only. With X11 release 17 software, the backup D-channel provides connections from Meridian 1 to the following systems:

- Meridian 1
- SL-100
- DMS-100 (BCS32 and later)
- DMS-250 (BCS 32 and later)
- AT&T 4ESS

In X11 release 17, the backup D-channel conforms to the Meridian Customer Defined Networking (MCDN) protocol and AT&T's TR41449 and TR41459.

**Backup D-channel capacity per PRI link**

The maximum number of network loops per PRI link is 16. With 24 channels per loop, 16 network loops provide a maximum of 382 B-channels ( $[16 \times 24] - 2$ ) and 2 D-channels per PRI link. Using the maximum number of 16 network loops requires the ISDN backup D-channel functionality. With 15 or fewer network loops, the backup D-channel is not required but it is recommended. Without a backup D-channel, 15 network loops provide a maximum of 359 B-channels ( $[15 \times 24] - 1$ ) and 1 D-channel.

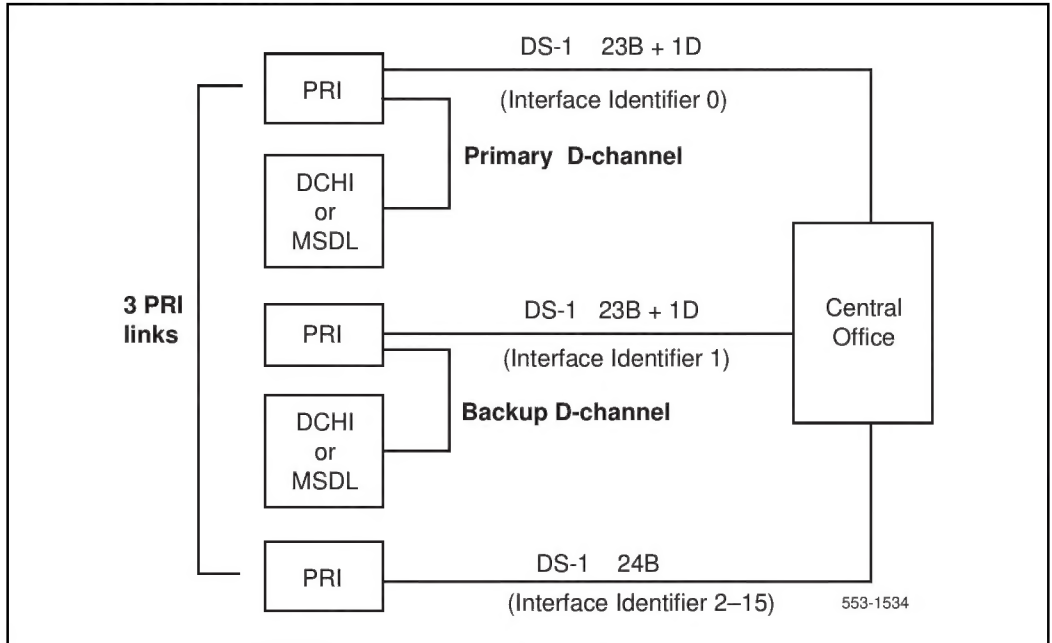
**Total backup D-channel capacity**

With X11 release 17 and earlier, a maximum of eight D-channels are allowed per system with the QPC757 a total of four active D-channels per system and four backup D-channels are available. This allows four PRI links per system, or  $4 \times 382 = 1,528$  B-channels. With the NT6D11AB, you can have up to 15 D-channels in your system. Seven can be used as primary, and seven as the backup D-channels. You can have seven PRI links per system (when all have a backup D-channel). You can, therefore, have  $7 \times 382 = 2,674$  B-channels.

X11 release 18 supports up to 64 D-channels with the MSDL card, providing a maximum of 32 active D-channels and 32 backup D-channels. This capacity allows for a great deal of system flexibility since some D-channels may require backup D-channels and others may not due to customer traffic configurations.

**Note:** With X11 release 18 and later, primary and backup D-channels must be the same card type.

**Figure 16**  
**PRI with backup D-channel**



## Operating parameters

The active D-channel is responsible for call processing signaling for all B-channels in the route.

The backup D-channel does not perform any call processing signaling until it is active. Load sharing between the two D-channels is not allowed.

A switchover from the active D-channel to the backup D-channel is allowed only when the active D-channel goes down or is disabled.

Channel 24 of the first PRI loop is reserved for the primary D-channel. Channel 24 of the second PRI loop is reserved for the backup D-channel, if provisioned. The assignment of the primary and secondary D-channels must match at both ends to ensure that they try to bring up the primary D-channel first at start-up.

During the switchover from the active D-channel to the standby, call control messages received by the D-channel before it becomes active are ignored. Therefore, the calls that are in a transient state are not guaranteed completion. Established calls remain in active state. Some portion of the established calls, for example, the message associated user-to-user information element, may be lost.

With a Meridian 1 to Meridian 1 interface, the active D-channel switches to the standby D-channel when a Service message is received in either of the following formats:

- the MCDN format
- the X11 release 13 format, even though it does not have the Channel Identification Information Element

With X11 release 16 and later, the backup D-channel attempts to bring the primary D-channel to the In-service state first during the start-up period. If the backup D-channel is established first, the X11 release 17 backup D-channel sends a Service message and enters into the WAIT state. During this time, if the primary D-channel is established, the primary D-channel of the X11 release 17 sends a Service message and it enters the WAIT state. The backup D-channel enters the Maintenance Busy state where it does not process or receive any messages. Thus, only the primary D-channel can receive the Service ACK message to become the active D-channel first. The backup D-channel is established as the standby D-channel afterward.

## Feature interactions

- Timer 309  
Timer 309 specifies a 90-second wait interval after a failure of layer 2 before the active calls are removed from service. For Meridian 1 to Meridian 1, active calls remain whether the D-channel goes down or not. If the T309 expires for both the primary D-channel and the backup D-channel, active calls are terminated on the SL-100, DMS-100, DMS-250, and AT&T 4ESS interfaces.
- Integrated Services Access  
Integrated Services Access (ISA) in the Meridian 1 manages Call-by-Call (CBC) service selection. After the switchover, transient calls might be lost, but the integrity of the minimum and maximum counters for each service route is maintained in the ISA.
- D-channel establishment  
Enter the ENL SERV command in LD 96 when the associated D-link is not established. After the D-link is established, the Service message for B-channels is exchanged between the near end and the far end switch. This is recommended for all CO interfaces.
- D-channel sanity polling  
For the Meridian 1 interface only, if the active D-channel has been idle for 30 seconds, a Service message for the D-channel is sent to the far end to poll the sanity of the D-channel. If the far end does not return Service Ack message, the near end tears down this D-channel and switches to the backup D-channel. It then reestablishes the torn down D-channel. This function is invoked by using the ENL SERV command in LD 96. If there is a mismatch of the active and backup D-channel at the two ends of the PRI, this function can be turned on to synchronize the D-channel state.

**Note:** Both the D-channel establishment and the D-channel sanity polling are addressed in LD 96. Enable the SERV command only when both D-channels are not established. Regardless of the IFC, the SERV option should always be enabled.

## Feature operation

The switchover from the primary D-channel to the backup D-channel is initiated when the backup D-channel receives either Release indication or Release confirmation from the active D-channel. A Service message is sent on the standby D-channel and the T321 timer (40 seconds) starts running. During this time, the system only processes Service messages and Service Ack messages, ignoring call control messages (for example, restart message or status inquiry message).

If the far end responds with a Service Ack message on the backup D-channel, then the backup D-channel becomes the active D-channel. If the T321 timer expires, the system tries to bring the inactive D-channel into the In-service state.

Automatic switchover occurs in the following situations:

- The PRI loop of the active D-channel issues a red alarm or yellow alarm.
- The D-channel Interface card of the active D-channel fails, is unplugged, or is hardware disabled.
- The cable connection between the QPC720 and the QPC757 of the active D-channel is disconnected.

Manual switchover involves issuing the DIS or RST DCH commands in LD 96 to the active D-channel. When this is done, the Primary Rate Interface (PRI) establishes the backup D-channel as the active D-channel.

When one D-channel is in the In-service state and the other D-channel is in the standby state, the active D-channel carries all call control messages. The standby D-channel ignores all messages other than Service and the Service Ack messages for the D-channel.

When using the QPC757 DCHI card, disable the backup D-channel software before disabling its hardware. This ensures that the QPC757 is in the reset condition before restoring it as the backup D-channel.

For Meridian 1 to Meridian 1 interfaces, RCVP can be set to YES or NO in LD 17 as long as the near and the far ends match. When interfacing to anything other than a Meridian 1, set RCVP = NO in LD 17.

## Feature packaging

Backup D-channel is included in basic ISDN PRI/ISL functionality. No additional packages are required.

## Feature implementation

Basic PRI or ISL administration must be performed before the backup D-channel is defined. The PRI loop must already be defined in LD 17.

### Procedure 11

#### Use LD 17 to configure the backup D-channel (X11 release 17 and earlier) (Part 1 of 2)

| Prompt | Response       | Description                                                                                                                                                                                                                                                                                                                                                                                   |
|--------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| REQ    | CHG            | Change configuration record                                                                                                                                                                                                                                                                                                                                                                   |
| TYPE   | CFN            | Configuration record                                                                                                                                                                                                                                                                                                                                                                          |
| PWD2   | xxxx           | Password                                                                                                                                                                                                                                                                                                                                                                                      |
| ISDN   | YES            | Change ISDN options                                                                                                                                                                                                                                                                                                                                                                           |
| DCHI   | 1–15           | Primary D-channel port number                                                                                                                                                                                                                                                                                                                                                                 |
| BCHI   | 1–15           | Backup D-channel port number                                                                                                                                                                                                                                                                                                                                                                  |
| USR    | PRA, ISLD, SHA | D-channel mode<br>PRA = D-channel for ISDN PRI only<br>ISLD = D-channel for ISL only, in dedicated mode, without using the PRI channel<br>SHA = Shared mode. D-channel used for both ISDN PRI and ISL.<br>One of the above responses is required. There is no default.                                                                                                                        |
| RCVP   | YES, (NO)      | Recover to primary D-channel. When RCVP = YES, the primary D-channel is automatically forced to be the active channel after it is brought up from a released state. Both sides must be either YES or NO. If the two sides do not match, both sides default to NO.<br><br>This prompt applies to Meridian 1 interfaces only. When IFC = D100, D250, SL100, or ESS4, set the RCVP prompt to NO. |
| DCHL   | 0–159          | PRI loop number for primary D-channel                                                                                                                                                                                                                                                                                                                                                         |

**Procedure 11****Use LD 17 to configure the backup D-channel (X11 release 17 and earlier) (Part 2 of 2)**

| Prompt | Response | Description                                                                                                                                                                                                                                                                             |
|--------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BCHL   | 0–159    | PRI loop number for backup D-channel                                                                                                                                                                                                                                                    |
| RLS    | xx       | Release ID for D-channel. This is the current software release of the far end (X11 or BCS). If the far end has an incompatible release of the software, it prevents the sending of application messages. Refer to <i>X11 input/output guide</i> (553-3001-400) for compatible releases. |

**Table 27****Use LD 17 to configure the backup D-channel (X11 release 18 and later) (Part 1 of 2)**

| Prompt | Response      | Description                                                                             |
|--------|---------------|-----------------------------------------------------------------------------------------|
| REQ    | CHG           | Change                                                                                  |
| TYPE   | CFN           | Configuration Record                                                                    |
| ADAN   | NEW BDCH 0–63 | Add a backup D-channel (also CHG, MOV, and OUT BDCH)                                    |
| PDCH   | 0–63          | Primary D-channel                                                                       |
| CTYP   | DCHI, MSDL    | Card type                                                                               |
| DNUM   | 0–15          | Device number: physical port (odd) for D-channel on DCH, physical card address for MSDL |



**Table 27****Use LD 17 to configure the backup D-channel (X11 release 18 and later) (Part 2 of 2)**

| Prompt | Response                  | Description                                                    |
|--------|---------------------------|----------------------------------------------------------------|
| _PORT  | 0–3                       | Port number on MSDL card                                       |
| USR    | PRI, ISLD, SHA            | D-channel mode                                                 |
| _ISLM  | 1–382                     | Number of ISL trunks controlled by the D-channel               |
| DCHL   | 0, 2, 4, ...159           | PRI loop number for DCHI                                       |
| OTBF   | 1–(32)–127                | Number of output request buffers                               |
| _BPS   | xxxx                      | Baud rate for ISL D-channel on MSDL port (default 64000)       |
| _PARM  | R232,(R422)<br>DCE, (DTE) | ISL D-channel interface and transmission mode (MSDL port only) |
| BCHL   | 0, 2, 4, ...159           | PRI loop number for backup D-channel                           |
| RCVP   | Yes, (No)                 | Auto-recovery to primary D-channel option                      |
| ADAN   | <cr>, ****                | Go on to next prompt or exit overlay                           |